Ch. 29 Potential and Field
P. 6, 12, 44
CQ. 4, 5

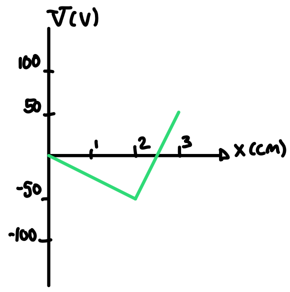
29.P.6 $V = 1.0\times10^{+6}\ V$

$V_{Bat} = \frac{W}{q}$ $V = 1.0\times10^{6}\ V$
$q = 1.602\times10^{-19}\ C$

$W = qV$
$= (1.602\times10^{-19}\ C)(1.0\times10^{6}\ V)$
$W = 1.602\times10^{-13}\ J$

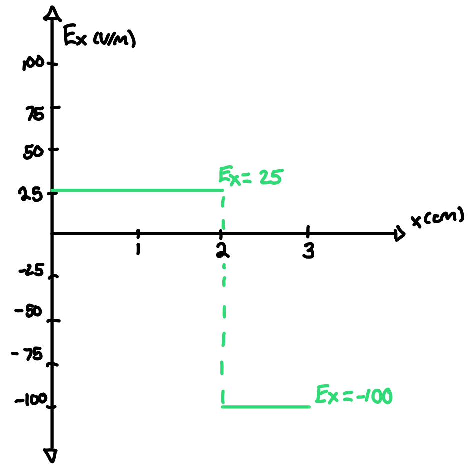
$W = 1.602\times10^{-13}\ J$

29.P.12



$E_x = -\frac{dV}{dx}$

ΔV $0 \le x \le 2cm$ ΔV $2 \le x \le 3cm$
$\Delta V = -25x$ $\Delta V = 100x$
$E_x = 25$ $E_x = -100$



29.P.44 $V = \frac{200}{\sqrt{x^2+y^2}}$ $\vec{E}$? @ (2.0m, 1.0m)

$E = -\frac{d}{dV}$

$E_x = -\frac{dV}{dx}$: $\frac{-200x}{\frac{\sqrt{x^2+y^2}}{x^2+y^2}} = \frac{-200x}{(x^2+y^2)^{3/2}}$ $E_y = -\frac{dV}{dy}$: $E_y = \frac{-200y}{(x^2+y^2)^{3/2}}$

$(x^2+y^2)^{1/2}$
$\frac{1}{2}(x^2+y^2)^{-1/2}\,2x$

$\frac{-200(y)}{\frac{\sqrt{x^2+y^2}}{x^2+y^2}} = \frac{-200y}{(x^2+y^2)^{3/2}}$

$\frac{2x}{2\sqrt{x^2+y^2}} = \frac{x}{\sqrt{x^2+y^2}}$

$E_x(2.0m, 1.0m)$
$\frac{-200(2m)}{(2^2+1^2)^{3/2}} = -178.89\ V/m\ \hat{i}$

$E_y(2.0m, 1.0m)$
$\frac{-200(1.0m)}{(2^2+1^2)^{3/2}} = -89.44\ V/m\ \hat{j}$

$\tan\theta = \frac{y}{x}$
$\theta = \tan^{-1}\left(\frac{-89.44}{-178.89}\right)$
$\theta = 26.6^\circ$

$E_x = -178.89\ V/m\ \hat{i}$
$E_y = -89.44\ V/m\ \hat{j}$
$\theta = 26.6^\circ$

29.CQ.4 $E = -\frac{dV}{ds}$

a.) $E = -\frac{dV}{ds} = -\frac{\Delta V}{\Delta s}$

$\vec{E}_1 = \left(\frac{10V - 0V}{1m}\right) = -10\ V/m\ \hat{i}$ $\vec{E}_2 = \left(\frac{40V - 30V}{1m}\right) = -10\ V/m\ \hat{i}$

$\vec{E}_1 = -10\ V/m\ \hat{i}$
$\vec{E}_2 = -10\ V/m\ \hat{i}$

b.) $E = -\frac{dV}{ds} = -\frac{\Delta V}{\Delta s}$

$\vec{E}_1 = \left(\frac{10V - 0V}{2m}\right) = -5\ V/m\ \hat{i}$ $\vec{E}_2 = \left(\frac{40V - 20V}{1m}\right) = -20\ V/m\ \hat{i}$

$\vec{E}_1 = -5\ V/m\ \hat{i}$
$\vec{E}_2 = -20\ V/m\ \hat{i}$

29.CQ.5

The electron will move to the left due to the electric field acting to the left.

$E = \frac{-\Delta V}{\Delta s}$